

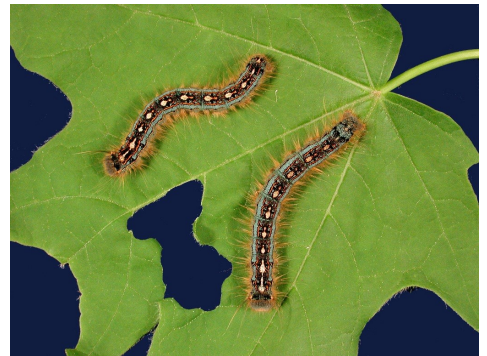
Vermont Forest Health

Forest Tent Caterpillar Update

Department of Forests, Parks & Recreation
September 2016
vtforest.com

A Forest Tent Caterpillar outbreak is underway in Vermont, with heavy defoliation occurring for the first time since 2006. In 2016, approximately 24,500 acres of defoliation were mapped during statewide aerial surveys. Forest tent caterpillar is a native insect, and part of our hardwood ecosystem. Most trees will recover, but defoliation is a stress on affected trees, and can incite tree decline if other stresses are present. This leaflet describes the current status of forest tent caterpillar, and provides management information for sugar makers, forest land managers, and others concerned about protecting tree health.

Forest tent caterpillar is a native insect.

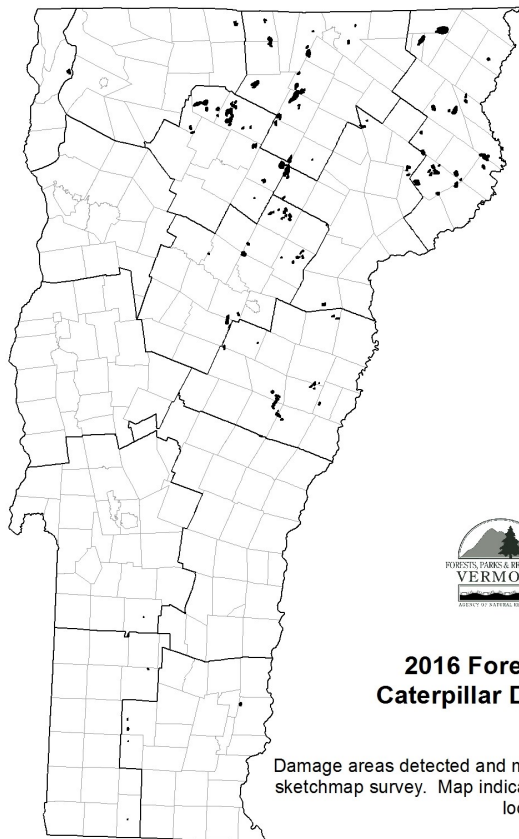


Hosts, History, and Distribution

The species most commonly defoliated in Vermont are sugar maple and white ash, but forest tent caterpillar will feed on most deciduous species. Red maple is not a host.

Forest tent caterpillar is a native insect, which occurs in hardwood forests in much of North America. Outbreaks occur periodically, and last 2-6 years. In 2006, at the peak of the most recent outbreak, about 10% of Vermont's northern hardwood forest type was defoliated. By contrast, the 2016 area of defoliation covers less than 1% of the state's hardwoods.

Populations are building throughout the state. However, the area of heaviest defoliation includes parts of Essex, Lamoille, Orleans, and Caledonia Counties.



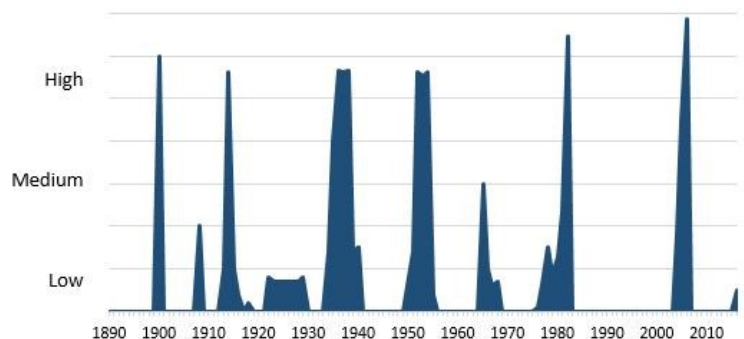
2016 Forest Tent Caterpillar Defoliation

Damage areas detected and mapped by aerial sketchmap survey. Map indicates approximate location of damage



In 2016, approximately 24,500 acres of defoliation were mapped during aerial surveys. (Defoliated area not to scale. Data includes survey information from the U.S. Forest Service, Forest Health Protection)

VT Forest Tent Caterpillar Defoliation: 1890 - 2016



Outbreaks have occurred periodically in Vermont, and generally last 2-6 years.

Life Cycle

Forest tent caterpillars emerge, over a period of several weeks, when sugar maple leaves unfold in the spring. Young caterpillars can spread by “ballooning” from long threads. They molt four times as they grow, leaving cast skins behind. Defoliation increases quickly when they are large. Often, only veins and leafstalks are left on host species.

Feeding is complete by early July. When about 2” long, the caterpillars pupate inside white cocoons, usually within rolled up leaves. If leaves are in short supply, cocoons are made on the bark, tubing, buildings, and ground vegetation. Moths emerge about two weeks later. They mate and lay eggs on twigs, preferably on upper branches, in masses that contain 150-200 eggs. Embryos inside the eggs develop quickly and consume carbohydrates throughout the winter. There is one generation per year.



Outbreaks collapse due to starvation, parasitic insects such as the friendly fly (above) or diseases (left).



Leaf fragments on the ground are a sign that defoliators have been active. In May and June, look for masses of resting caterpillars. (Photo on right: E. Schadler, UVM Extension)

What to Look For

During May and June while caterpillars are active, listen for their droppings, look for leaf fragments on the ground, and for masses of caterpillars resting on the bark. In mid-late summer, look for rolled up green leaves with a white cocoon inside. After leaf drop, use binoculars to see egg masses on the twigs of upper branches.

Forest tent caterpillars do not make a tent! Tents seen in the spring in branch crotches of cherry or apple trees are made by the [eastern tent caterpillar](#). Webbing on the ends of branches later in summer is most likely [fall webworm](#).

Caterpillars emerge in spring when sugar maple leaves unfold.

Cast skins are left behind when they molt. (Photo: M. Isselhardt, UVM Extension)

Defoliation increases quickly as the caterpillars grow.



The white cocoons are usually found in rolled up leaves (arrow). Moths prefer to lay eggs in the upper portion of the tree. (Center photo: M. Isselhardt, UVM Extension)

Forest tent caterpillars are native, and natural enemies including birds, spiders and parasitic insects keep populations in check. (With the exception of cuckoos, most birds avoid the hairs and only eat the innards.) Outbreaks occur when forest tent caterpillar growth outpaces their natural enemies, such as during early warm springs. Populations build up more quickly in forests dominated by sugar maple and ash, and in stands which have been recently thinned. In open forests, caterpillar diseases spread more slowly, and parasitic insects are more vulnerable to predation.

Outbreaks collapse from a combination of factors: starvation, malnutrition from eating less-preferred tree species, viral or fungal diseases, and high rates of parasitism. Parasitic insects increase in numbers, including the friendly fly (*Sarcophaga aldrichi*) which lays eggs on forest tent caterpillar cocoons. Outbreaks may also collapse prematurely if eggs hatch early and cold temperatures delay bud development, or if there is a late spring frost. Winters are rarely cold enough to affect survival.

Unlike the forest tent caterpillar, the eastern tent caterpillar (arrow) makes a tent.



Impact

Healthy hardwoods can survive several consecutive years of defoliation. Within a few weeks of heavy defoliation, trees re-foliate. Buds that would normally have generated new shoots the following spring expand and produce new foliage. Then new buds are set.

Dry conditions will be an important factor determining the impact of the 2016 defoliation. While conditions were driest in southeastern Vermont, summer was abnormally dry in most of the state. Lack of water reduced the success of re-foliation. Defoliated areas remained noticeable all summer because new foliage expansion was reduced. Sometimes, tender re-foliated shoots withered, and leaves were scorched.

Defoliation reduces a tree's ability to produce and store carbohydrates. Even where re-foliation was successful, dry conditions in 2016 have limited the new leaves' ability to replenish lost food. This will almost certainly affect wood production, and the amount of foliage and shoot growth next year.

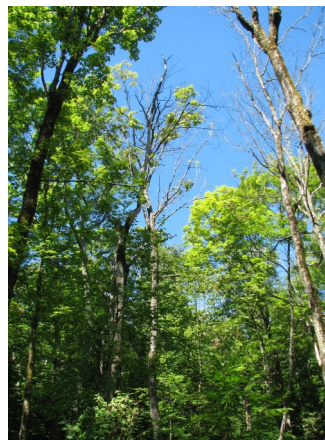
There is always a risk that defoliation could lead to dieback or even tree mortality. In addition to drought, consecutive years of defoliation, severe winters, and other disturbances magnify the impact. Extremely high caterpillar populations are another risk factor when they defoliate trees so quickly that caterpillars are still present and feeding when the re-foliation emerges.

After multiple defoliations, or if other stresses are present, food reserves may be depleted so that a tree's ability to survive the winter, defend itself from secondary pests, and maintain its living cells are impaired. Maple trees on sites rich in calcium and magnesium are better equipped to recover from stress. Site factors that increase the risk of tree decline include acid soils, ridgetops, rocky ledge, or wet areas.

Management Recommendations

- Look for signs of forest tent caterpillar and defoliation. Assume that tree health has been affected if over half the foliage is missing.
- If trees were heavily defoliated, check after late July to make sure they have re-foliated, and that the new leaves are not stunted or brown.
- You can estimate the risk of defoliation next year by doing an [egg mass survey](#) once the leaves have dropped in the fall.
- Trees are resilient, but more caution is called for where summer was dry, if heavily defoliated trees didn't re-foliate successfully, where trees were recently thinned, or if the site is less-than-optimal.

Assume tree health is affected if over half the leaf area was defoliated. Check to make sure that heavily defoliated trees re-foliated (above right). Trees with stunted and/or brown re-foliation (below right) are at greatest risk.



Multiple defoliations may lead to decline, especially in stands that were recently thinned, when accompanied by drought, following cold and snow-free winters, or on nutrient-poor sites.

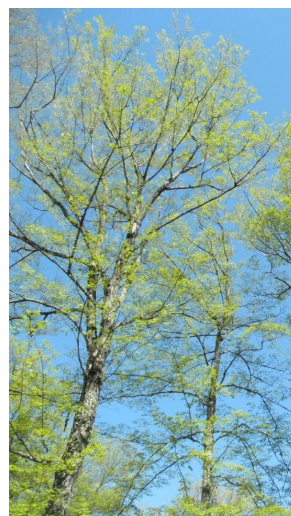
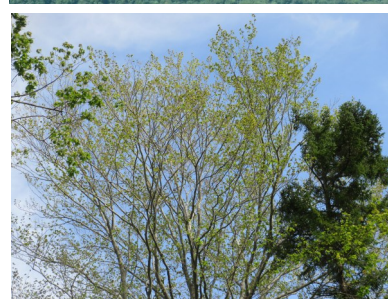
Trees should start to re-foliate within a few weeks of heavy defoliation. (Photo: M. Isselhardt, UVM Extension)



However, in 2016, defoliated areas remained visible throughout the summer because dry conditions reduced re-foliation success.



Trees that were still defoliated in September had limited ability to replenish food reserves.



For Sugarbush Management

In addition to the reduction in carbohydrate production, the decreased wood growth of defoliated trees reduces taphole closure and tapping sustainability. A minimum recommendation is to “tap conservatively” and delay thinning for 1-3 years. Consider not tapping small diameter trees, or with more than one tap regardless of diameter.

Sugar makers who need to harvest a crop annually, may want to consider foliage protection where defoliation is likely next year. Spraying is done in mid-May after the eggs have hatched and maple foliage is fully expanded.

The only legal material for controlling caterpillars on maple that will be tapped for a food crop is the biological insecticide Bt. The Foray Bt product that was used to protect sugarbushes in the last outbreak is now OMRI (Organic Materials Review Institute) certified.

By request, the Department of Forests, Parks, and Recreation will provide assistance in conducting egg mass surveys. While many factors determine future defoliation, survey results should help sugar makers decide about tapping intensity and getting trees sprayed. We will also be available to assist sugar makers in delineating areas to be sprayed. Contact your County Forester or one of the offices below.

It is too early to know if any government funds will be available to help pay for application costs, and if forest tent caterpillar populations will justify a state-coordinated spray project in 2017. However, we are preparing for this possibility.

Even if a sugarbush is sprayed, some defoliation will occur. The caterpillars need to be actively feeding to eat the Bt. Spraying can be delayed by weather or other operational constraints, and there may be missed areas.

For Timber Management

It’s time to postpone harvesting where populations are building. By reducing the number of trees in the stand, you will get more insects on each remaining tree.

If a stand is defoliated, delay timber harvesting at least 3 years after the outbreak. In the short term, thinning allows soil to dry and disturbs roots. The delay also allows time for the impacts of defoliation to become apparent and so the healthiest trees can be identified.

Unless there are significant additional concerns, we have not found it necessary to protect foliage of timberland trees.

For Shade Trees

For those homeowners and arborists who want to protect the foliage of valuable shade trees or reduce nuisance caterpillars, we also recommend Bt. Large trees require specialized equipment.

Citation: Vermont Dept. of Forests, Parks, and Recreation. 2016. Forest Tent Caterpillar Update. Vermont Forest Health leaflet 2016-08. 4 pp. Available at vtforest.com.

Where not otherwise credited, images are from VT-FPR, including the Ron Kelley photo archive.



Egg mass surveys help estimate the risk of defoliation next year.



Only Bt products may be used to spray active sugarbushes; certified-organic Bt is now widely available.



For more information, contact the Forest Biology Laboratory at 802-879-5687 or:	Windsor & Windham Counties.....	Springfield (802) 885-8845
	Bennington & Rutland Counties.....	Rutland (802) 786-0060
	Addison, Chittenden, Franklin & Grand Isle Counties.....	Essex Junction (802) 879-6565
	Lamoille, Orange & Washington Counties.....	Barre (802) 476-0170
	Caledonia, Orleans & Essex Counties.....	St. Johnsbury (802) 751-0110